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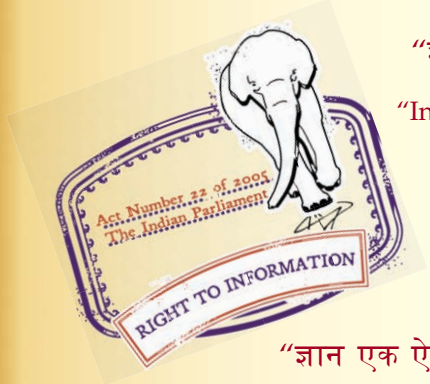
"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 3328 (1993): Quality tolerances for water for swimming pools [CHD 13: Water Quality for Industrial Purposes]



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Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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IS 3328 : 1993
(Reaffirmed 2003)

भारतीय मानक

तरण तालों के लिए पानी की गुणता छूटें

(पहला पुनरीक्षण)

Indian Standard

QUALITY TOLERANCES FOR WATER FOR SWIMMING POOLS

(First Revision)

UDC 628·1 : 543·3 : 620·16 : 725·74

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

July 1993

Price Group 3

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Water Sectional Committee had been approved by the Chemical Division Council.

Swimming pools may be divided into natural pools and artificial pools. For the natural swimming pools, it is not possible to lay down uniform standards because of the considerable variability in the quality of such waters. The artificial pools are either of fill-and-empty type or of continuous circulation type. The fill-and-empty type of pools is not favoured now because of the attendant accumulation of impurities.

This standard is intended to assist public health bodies and other organizations in maintaining a level of quality of water in swimming pools considered safe from the point of view of health and hygiene.

This standard was first published in 1965. Based on the experience gained over the years, the concerned technical committee responsible for the formulation of this standard decided to revise it. In this revision, requirements for total dissolved solids and chlorides have been incorporated besides, giving reference to the latest method of tests.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

AMENDMENT NO. 1 JULY 2010
TO
IS 3328 : 1993 QUALITY TOLERANCES FOR WATER FOR SWIMMING POOLS

(First Revision)

(*Page* 1, *clause* **2)** — Delete '3025 : 1964 Methods of sampling and test (physical and chemical) for water used in industry' and insert the following after '3025 (Part 32) : 1988 Methods of sampling and test (physical and chemical) for water and wastewater: Part 32 Chlorides (*first revision*)' under *IS No.* and *Title*:

'IS 3025 (Part 53) : 2003 Methods of sampling and test (physical and chemical) for water and wastewater: Part 53 Iron (*first revision*)

IS 3025 (Part 55) : 2003 Methods of sampling and test (physical and chemical) for water and wastewater: Part 55 Aluminium (*first revision*)

IS 3025 (Part 63) : 2007 Methods of sampling and test (physical and chemical) for water and wastewater: Part 63 Oxygen absorbed in 4 hours (*first revision*)'

(*Page* 1, *clause* **3.2**, *line* 3) — Delete 'IS 3025 : 1964 and'.

[*Page* 2, *Table* 1, *Sl No.* (iii), *col* 4] — Substitute 'IS 3025 (Part 55) : 2003' *for* '31 of IS 3025 : 1964'.

[*Page* 2, *Table* 1, *Sl No.* (v), *col* 4] — Substitute 'IS 3025 (Part 63) : 2007' *for* '51 of IS 3025 : 1964'.

[*Page* 2, *Table* 1, *Sl No.* (viii), *col* 4] — Substitute 'IS 3025 (Part 53) : 2003' *for* '32 of IS 3025 : 1964'.

(*Page* 2, *clause* **4.1**, *line* 3) — Substitute 'IS 3025 (Part 1) : 1987' *for* '**2** of IS 3025 : 1964'.

(*Page* 2, *clause* **5.1**, *line* 2) — Delete 'IS 3025 : 1964'.

(CHD 13)

Reprography Unit, BIS, New Delhi, India

Indian Standard

QUALITY TOLERANCES FOR WATER FOR SWIMMING POOLS

(First Revision)

1 SCOPE

This standard prescribes the quality tolerances for water used in swimming pools of continuous circulation type.

2 REFERENCES

The following Indian Standards listed below are the necessary adjuncts to this standard:

IS No.	*Title*
1622 : 1981	Methods of sampling and microbiologlcal examination of water (*first revision*)
3025 : 1964	Methods of sampling and test (physical and chemical) for water used in industry
3025 (Part 4) : 1983	Methods of sampling and test (physical and chemical) for water and wastewater: Part 4 Colour (*first revision*)
3025 (Part 5) : 1983	Methods of sampling and test (physical and chemical) for water and wastewater: Part 5 Odour (*first revision*)
3025 (Part 8) : 1984	Methods of sampling and test (physical and chemical) for water and wastewater: Part 8 Taste rating (*first revision*)
3025 (Part 10) : 1984	Methods of sampling and test (physical and chemical) for water and wastewater: Part 10 Turbidity (*first revision*)
3025 (Part 11) : 1983	Methods of sampling and test (physical and chemical) for water and wastewater: Part 11 *p*H value (*first revision*)
3025 (Part 16) : 1984	Methods of sampling and test (physical and chemical) for water and wastewater: Part 16 Filterable residue (total dissolved solids) (*first revision*)
3025 (Part 23) : 1986	Methods of sampling and test (physical and chemical) for water and wastewater: Part 23 Alkalinity (*first revision*)
3025 (Part 26) : 1986	Methods of sampling and test (physical and chemical) for water and wastewater: Part 26 Chlorine, residual (*first revision*)
3025 (Part 32) : 1988	Methods of sampling and test (physical and chemical) for water and wastewater: Part 32 Chloride (*first revision*)
7017 : 1973	Method of colorimetric determination of traces of heavy metals by dithizone

3 TOLERANCES

3.1 Physical

3.1.1 *Clearness*

The water shall be clear odourless and colourless and shall be sufficiently clear at all times when the pool is in use to pass the following test:

> Place a black disc, 150 mm in diameter and fixed to a white background, on the bottom of the pool at the deepest point. The disc shall be clearly visible from the side walks of the pool at all distances up to 9 meters in a line drawn across the pool through the said disc.

3.2 Chemical

The water shall comply with the chemical tolerances prescribed in Table 1. Tests shall be carried out as prescribed in IS 3025 : 1964 and various parts of IS 3025. Reference to relevant clauses of this standard is given in col 4 of the Table.

3.3 Bacteriological

3.3.1 *Standard Plate Count*

The standard plate count of the sample, determined as prescribed in Annex A, shall be not more than 100 per millilitre.

Table 1 Chemical Tolerances for Water for Swimming Pools

(*Clauses* 2.2 *and* 5.1)

Sl No.	Characteristic	Tolerance	Method of Test, Ref to IS
(1)	(2)	(3)	(4)
i)	*p*H value	7·5 to 8·5 (*see* Note)	3025 (Part 11) : 1983
ii)	Total alkalinity (as $CaCO_3$), mg/l, *Max*	50 to 500 (*see* Note)	3025 (Part 23) : 1986
iii)	Aluminium (as Al), mg/l, *Max*	0·1	31 of IS 3025 : 1964
iv)	Total residual chlorine, mg/l		3025 (Part 26) : 1986
	a) At inlet, *Max*	0·5	
	b) At outlet, *Min*	0·2	
v)	Oxygen absorbed in 4 hours at 27°C, mg/l, *Max*	1·0	51 of IS 3025 : 1964
vi)	Total dissolved solids, mg/l, *Max*	1 500	3025 (Part 16) : 1984
vii)	Chloride (as Cl), mg/l, *Max*	500	3025 (Part 32) : 1988
viii)	Iron, mg/l, *Max*	0·1	32 of IS 3025 : 1964
ix)	Heavy metals (as Pb), mg/l, *Max*	0·1	IS 7017 : 1973
x)	Colour, Hazen units, *Max*	10	IS 3025 (Part 4) : 1983
xi)	Turbidity, NTU, *Max*	10	IS 3025 (Part 10) : 1984
xii)	Odour	Odourless	IS 3025 (Part 5) : 1983
xiii)	Taste	Palatable	IS 3025 (Part 8) : 1984

NOTE — Too low an alkalinity and low *p*H are the most common causes of complaints of taste, odour and eye irritation. At *p*H lower than 7·5, there is an increased tendency for formation of dichloramine and nitrogen chlorides or similar compounds which cause eye irritation.

3.3.2 *Coliform Organisms*

When tested as prescribed in IS 1622 : 1981, not more than 10 percent of 10-ml portions of the sample tested over a period of one month shall show the presence of any coliform organism. If any Most Probable Number (MPN) result is more than 10 per 100 ml, a fresh sample shall be tested within 24 hours. The two consecutive results shall not show MPN index of coliform organism of more than 10 per 100 ml.

4 SAMPLING

4.1 Representative test samples of water shall be drawn as prescribed in 2 of IS 1622 : 1981, and 2 of IS 3025 : 1964.

5 TEST METHODS

5.1 Test shall be carried out as prescribed in IS 1622 : 1981, IS 3025 : 1964 and in Annex A. Reference to the relevant clauses of IS 1622 : 1981 and Annex A, is given in col 4 of Table 1 and **3.3.1**.

ANNEX A

(*Clauses* 3.3.1 *and* 5.1)

DETERMINATION OF STANDARD PLATE COUNT

A-1 APPARATUS

A-1.1 Dilution Bottles and Tubes

Bottles or tubes of resistant glass, preferably pyrex, closed with glass stoppers, rubber stoppers, or screw caps equipped with liners that do not produce toxic or bacteriostatic compounds on sterilization shall be used. Cotton plugs shall not be used as closures. Graduation levels shall be indelibly marked on the side of dilution bottle.

A-1.2 Autoclaves

Of sufficient size and shall keep uniform temperature within the chamber up to and including the sterilizing temperature of 121°C. They shall be equipped with an accurate thermometer located so as to register the minimum temperature within the sterilizing chamber, a pressure gauge and properly adjusted safety valves.

A-1.3 Pipettes

1-ml, straight-sided delivery pipettes. The tips shall be unbroken.

A-1.4 Petri Dishes

Of 100 mm diameter and 15 mm depth. The bottom of the dishes shall be free from bubbles and scratches and shall be flat so that the medium shall be of uniform thickness throughout the plate.

A-1.5 Incubator

Maintaining a uniform and constant temperature of 35·0 ± 0·5°C at all times in all parts. The use of water-jacketed or anhydric type with thermostatically controlled low-temperature electric heating units and equipped with mechanical means of circulating air shall be preferred. The incubators shall have sufficient space to accommodate the culture racks and plates, with at least 2·5 cm space between adjacent stacks and between walls and stacks. They shall be provided with accurate thermometers and a daily record of the temperature shall be maintained.

A-1.6 Colony Counter

An approved counting aid, such as Quebee colony counter. If such a counter is not available, then counting may be done with a lens giving a magnification of 1·5 diameters. In order to ensure uniformity of conditions during counting, illumination equivalent to that provided by the Quebee colony counter shall be employed.

A-2 REAGENTS

A-2.1 Buffered Dilution Water

Dissolve 34·0 g of potassium dihydrogen phosphate (KH_2PO_4 in 500 ml of distilled water, adjust to *p*H 7·2 with 1 M sodium hydroxide solution and make up to 1 litre with distilled water. Add 1·25 ml of the above solution to 1 litre of distilled water. Dispense in amounts that provide 99 ± 2 ml, or 9·0 ± 0·2 ml, after autoclaving for 20 minutes.

A-2.2 Tryptone Glucose Extract Agar Medium

Add 3 g of beef extract, 5 g of glucose, and 15 g of agar of each litre of distilled water. Heat to boiling untill all ingredients are dissolved. Make up lost weight with hot distilled water. Adjust the reaction so that the *p*H reading after sterilization will be between 6·8 and 7·0. Bring to a boiling temperature, stirring vigorously. Make up lost weight with hot distilled water and clarify. Distribute to the desired containers and sterilize in the autoclave at 121°C. When the pressure reaches zero, remove the medium from the autoclave and cool quickly to avoid decomposition to sugars. Store the medium in a melted condition in a container which provides for maintenance of a temperature of 43 to 45°C.

A-3 STERILIZATION OF APPARATUS

A-3.1 Dilution Bottles or Tubes

Sterilize the bottles or tubes in the autoclave at 121°C for 15 minutes after the temperature reaches 121°C.

A-3.2 Petri Dishes

Wrap the petri dishes in kraft paper and sterilize in the hot-air oven at 160°C for one hour.

A-3.3 Pipettes

Place the pipettes in copper, stainless steel or aluminium cylinders with cover or individually wrapped in paper and sterilize in the hot-air oven at 160°C for one hour.

A-4 PROCEDURE

A-4.1 Dilution

Fill the dilution bottles or tubes with proper amount of buffered dilution water so that after sterilization they contain the desired quantity with a tolerance of 2 percent. The exact amount of water to be placed in the bottle may be determined only by experiment with the particular autoclave in use. Only buffered dilution water is to be used for dilution. Tap water or distilled water shall not be used.

A-4.1.1 Shake the sample bottle vigorously 25 times. Transfer with a sterile pipette 10 ml, 1 ml or 0·1 ml of the sample to the proper dilution bottle, tube or petri dish as required. Shake each dilution bottle or tube vigorously 25 times after the addition of portion of the sample and before a second dilution or sample is removed.

A-4.2 Plating

The amount of the sample taken should be such as will give 30 to 300 colonies on a plate. Ordinarily, it is not desirable to plate more than 1 ml of water in a plate; therefore, when the total number of colonies developing from 1 ml is less than 30, it is obviously necessary to record the result as observed, disregarding the general rule given above. Take 1 ml, 0·1 ml or other appropriate volume of the sample dilution for plating in petri dish. Add not less than 10 ml of liquefied tryptone glucose extract agar medium at a temperature of 43 to 45°C to

water in the petri dish. Flame the lips of all test tubes or flasks used for pouring the medium. Lift the cover of the petri dish just enough for the introduction of either pipette or the culture medium. Mix thoroughly the medium and sample and uniformly spread over the bottom of the petri dish by tilting and rotating the dish. Solidify all plates as rapidly as possible after pouring and place them immediately in the incubator. Not more 20 minutes shall elapse between plating and pouring.

A-4.3 Incubation

Incubation shall be done at 35·0 ± 0·5°C. Incubate for 24 ± 2 h. Invert the glass covered petri dishes in the incubator. Place the dishes in the incubator as prescribed in **A-1.5**.

A-4.4 Counting

In determining the standard plate count, only such plates should be considered which sow 30 to 300 colonies except as provided in **A-4.2**. Counting shall be done with an approved counting aid (**A-1.6**).

A-4.4.1 If the same amount of water has been planted in 2 or more replicate plates and of these one shows colonies within the limits mentioned in **A-4.4** while others show less than 30 or more than 300 colonies, the results recorded shall be the average of all the plates planted with this volume of sample.

A-4.4.2 In order to avoid fictitious accuracy and yet expense the numerical results by a method consistent with the precision of the technique employed, the recorded number of bacteria per millilitre shall be reported as follows:

Up to 100	To the nearest unit
More than 100	To the nearest 5 units

Counts shall be designated as the standard plate count at 35°C.

ANNEX B

(Foreword)

COMMITTEE COMPOSITION

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